REMARKS

Examiner objected to the drawing. In particular, the Examiner stated:

> The drawings are objected to because of draftsperson's remarks (see attached PTO-948 paper number 4). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Applicant respectfully submits that the draftsperson's remarks merely relate to formalities which can be corrected after the case is allowed.

In light of the above, Applicant respectfully requests that the Examiner withhold this objection until the case is allowed.

Examiner rejected claims 1, 5 and 6 under the judicially created doctrine of obviousness-type double patenting. In particular, the Examiner stated:

> Claims 1, 5 and 6 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1, of Application No.: 09/365,583. Although the conflicting claims are not identical, they are not patentably distinct from each other because of the following:
>
> As to claim 1, in an image processing system, a method for relating a first image to second image comprising:
>
> (a) aligning the first image with a second image, Application No.: 09/365,583 teaches see claim 1, step (b).
>
> (b) plotting a gray level of a pixel from the first image against a gray level of a corresponding pixel from the second image for all aligned pixel locations, Application No.: 09/365,583 teaches see claim 1, step (c).
>
> As to claim 5, a computer readable medium storing a program for carrying out the method of claim 1. Application No.: 09/365,583 teaches see claim 7.
>
> As to claim 6, a computer readable medium comprising: Application No.: 09/365,583 teaches see claim 7.

Applicant hereby submits a Terminal Disclaimer in compliance with 37 CFR 1.321(c). As such, Applicant respectfully requests that the Examiner withdraw this rejection.

Examiner rejected claims 1-7 under 35 U.S.C. 102(e). In particular, the Examiner stated:

> Claims 1-7, are rejected under 35 U.S.C. 102(e) as being anticipated by Alumot et al., (US 6,178,257 B1).

As per claim 1, Alumot teaches an image processing system, a method for relating a first image to a second image comprising the acts of:

(a) aligning (note, comparing the first image to the second image to see any misalignment between the two flows of data to provide a difference in data of a suspected pixel in the stream data, column 9, lines 25-42) the first image (note, first image is considered to be the inspected pattern and generating a first flow of N streams of data representing the pixel of different images of the inspected pattern column 9, lines 25-28) with a second image (note, second image is considered to be reference image and generating a second flow of N streams of data representing the pixels of different images of the reference pattern, column 9, lines 28-42); and

(b) plotting the gray level of a pixel (column 23, lines 28-45), from the first image (inspected image, fig 30 item 5) against the gray level of a corresponding pixel from the second image (reference image, fig 30, item 5) for all aligned pixel locations (column 4, lines 4-18, lines 59-65, column 23, lines 28-45, fig 30).

As per claim 2, Alumot teaches the method of claim 1 further comprising plotting a threshold window on a plot created in step (b) (column 15, lines 31-33).

As per claim 3, Alumot teaches the method of claim 1 wherein a plot created in step (b) is stored in a memory array variable (column 17, lines 50-60)(b).

As per claim 4, Alumot teaches the method of claim 1, wherein a plot created in step(b) is displayed on a video monitor (fig 1, item 16 and 17).

As per claim 5, Alumot teaches a computer-readable medium storing a program for carrying out the method of claim 1 (column 13, lines 23-32).

As per claim 6, Alumot teaches a computer-readable medium comprising:

a plurality of memory locations storing data representing a first image and an associated second image (column 3, lines 38-52), said first and second images each having a plurality of pixels with each pixel being defined by a location coordinate (column 10, lines 34-46) and a gray level (column 23, lines 28-37); and,

As per claim 7, Alumot teaches a defect inspection system comprising:

(a) an image acquisition unit (fig 2, item 12) being operable to acquire a first image and an associated second image (column 3, lines 38-52, column 9, lines 26-34) the first and second images each having a plurality of pixels with each pixel being defined by a location coordinate (column 10, lines 34-46) and a gray level (column 23, lines 28-37);

(b) a plurality of memory locations storing data representing the first image and the second image (column 3, lines 38-52); and

(c) a processor being operable to plot the gray levels of pixels from the first image against the gray levels of corresponding pixels from the second image (column 23, lines 28-37).

Applicant respectfully traverses the Examiner's rejection.

Regarding claim 1: Applicant respectfully submits that Alumot et al. teaches method and apparatus that is completely different from claim 1 which requires plotting a gray

level of a pixel from the first image **against** a gray level of a corresponding pixel from the second image for all aligned pixel locations.

In particular, Alumot et al. teaches a method of inspecting the surface of an article for defects by optically examining, in a first examination phase, the complete surface of the article and outputting information indicating locations on the article suspected of having defects, and storing the suspected locations in a storage device. Then, in a second examination phase, Alumot et al. teaches optically examining with high resolution only the suspected locations of the surface to determine the presence or absence of defects. The first examination phase is effected by making a comparison between the inspected pattern and another pattern serving as a reference. The second examination phase is also effected by making a comparison between an inspected pattern and a reference pattern (see col. 2, lines 10-19 and lines 35-51). As the Examiner can readily appreciate from this, the first examination phase entails comparison of two scans (an inspection scan and a reference scan), and the second examination phase entails comparison of two scans (an inspection scan and a reference scan). Further, Applicant respectfully submits that there is no teaching whatsoever of saving pixel location and gray level information from the two scans of the first examination phase for comparison with any pixel location and gray level information from the two scans of the second examination phase. Specifically, only locations of suspected defects are saved from the first examination phase.

As set forth in Alumot et al., to find suspect locations in the first examination phase, data of a first flow from an inspected pattern are compared with data of a second flow from a reference pattern. Specifically, as stated in Alumot et al. at col. 9, lines 35-41, "The comparison is effected by correcting any misalignment between the two flows of data; comparing the data of each stream of the first flow with the data of the corresponding stream of the second flow **to provide a difference or alarm value** indicating the significance of the presence of a suspected pixel in the stream; and detecting a defect at a pixel location according to N difference or alarm values corresponding to the N streams of data. (Emphasis added)" Applicant respectfully submits that this teaching of Alumot et al. –i.e., determining differences in gray levels and comparing the differences to an alarm level-- is completely different from claim 1

since this teaching provides no hint whatsoever for plotting gray levels from an inspection pattern against gray levels from a reference pattern as required by claim 1.

As set forth in Alumot et al. at col. 22, lines 57-64, the second examination phase includes two sets of images taken from the inspected pattern and the reference pattern, respectively. Each set includes five images taken with focuses at different depths to accommodate variations in the thickness of the wafer or to accommodate multi-layer patterns. In particular, Alumot et al. teaches how to match each image of an inspected pattern with an image of a reference pattern taken at a corresponding depth of focus. FIGs. 29-31 illustrate how the depth matching operation is performed (see col. 23, lines 17-37). For example, Alumot et al. teaches that depth matching is determined (see col. 23, lines 33-35) by "computing similarity in the variance of grey levels in the two images. The correlation measure used is the difference between the grey level histogram of the images." As the Examiner can readily appreciate from this, Alumot et al. does not teach plotting gray levels of the inspected pattern against the gray level of the reference pattern as required by claim 1.

Lastly, as set forth in Alumot et al. at col. 23, lines 4-10, for the second examination phase, Alumot et al. teaches comparing gray level images, pixel by pixel, using surrounding pixels and adaptive thresholds obtained from a dynamic range equalization circuit to provide a registration operation. As the Examiner can readily appreciate from this, Alumot et al. does not teach plotting gray levels of the inspected pattern against the gray level of the reference pattern as required by claim 1.

Thus, in light of the above, Applicant respectfully submits that Alumot et al. does not anticipate claim 1.

Regarding claim 2: Applicant respectfully submits that claim 2 depends from claim 1, and that claim 2 is patentable over Alumot et al. for the reasons set forth above with respect to claim 1. In addition, Applicant respectfully submits that Alumot et al. does not teach plotting a threshold window on a plot as required by claim 2. In particular, Applicant respectfully submits that col. 15, lines 31-33 of Alumot et al. does not teach plotting a threshold. Applicant respectfully submits that col. 15, lines 31-33 of Alumot et al. merely teaches determining if the intensity of a pixel is significant relative to a threshold defined dynamically in

a window of n x m pixels. As such, Applicant respectfully submits that Alumot et al. does not anticipate claim 2.

Regarding claim 3: Applicant respectfully submits that claim 3 depends from claim 1, and that claim 3 is patentable over Alumot et al. for the reasons set forth above with respect to claim 1. In addition, Applicant respectfully submits that Alumot et al. does not teach storing a plot as required by claim 3. In particular, Applicant respectfully submits that col. 17, lines 50-60 of Alumot et al. merely teaches "temporarily storing a window of up to 25 consecutive rows in the reference image, for the purpose of computing the score matrix of matches to a smaller window (up to three rows) in the inspected image." As such, Applicant respectfully submits that Alumot et al. does not anticipate claim 3.

Regarding claim 4: Applicant respectfully submits that claim 4 depends from claim 1, and that claim 4 is patentable over Alumot et al. for the reasons set forth above with respect to claim 1. In addition, Alumot et al. does not teach displaying a plot as required by claim 4. In particular, Applicant respectfully submits that FIG. 1 merely shows monitors. As such, Applicant respectfully submits that Alumot et al. does not anticipate claim 4.

Regarding claim 5: Applicant respectfully submits that claim 5 is patentable over Alumot et al. for the reasons set forth above with respect to claim 1. In addition, Applicant respectfully submits that Alumot et al. at col. 13, lines 23-32 merely teaches a correlation method for aligning an inspected and a reference image. As such, Applicant respectfully submits that Alumot et al. does not anticipate claim 5.

Regarding claim 6: Independent claim 6 requires an array of memory locations storing data representing a plot of the gray levels of pixels from the first image **against** the gray levels of corresponding pixels from the second image. As set forth above in regard to claim 1, Applicant respectfully submits that Alumot et al. does not teach or hint providing such an array. In particular, although Alumot et al. describes storing portions of an inspection image and a reference image, Applicant respectfully submits that Alumot et al. does not teach storing data representing a plot of the gray levels of pixels from the first image against the gray levels of corresponding pixels from the second image. Specifically, Applicant respectfully submits that Alumot et al. at col. 3, lines 38-52 merely teaches comparing corresponding pixels to indicate a

defect "whenever a mismatch of a predetermined magnitude is found to exist at the respective location." As such, Applicant respectfully submits that Alumot et al. does not anticipate claim 6.

Regarding claim 7: Independent claim 7 requires a processor being operable to plot the gray levels of pixels from the first image **against** the gray levels of corresponding pixels from the second image. As set forth above in regard to claim 1, Applicant respectfully submits that Alumot et al. does not teach or hint providing such a processor. In particular, although Alumot et al. variously describes storing portions of an inspection image and a reference image, Applicant respectfully submits that Alumot et al. does not teach a processor being operable to plot the gray levels of pixels from the first image against the gray levels of corresponding pixels from the second image. Specifically, as has been set forth above with respect to claim 1, Applicant respectfully submits that Alumot et al. at col. 23, lines 28-37 merely teaches performing a correlation to determine images at the same depth. As such, Applicant respectfully submits that Alumot et al. does not anticipate claim 7.

In light of the above, Applicant respectfully requests that the Examiner withdraw this rejection.

Examiner stated:

> The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
>
> Lee et al., (US. 5,808,735) discloses method for characterizing defects on semiconductor wafers.
>
> Sano et al., (US. 5,638,465) discloses image inspection/recognition method, method of generating reference data for use therein, and apparatuses therefor.
>
> Webb et al., (US. 6,285,397) discloses alignment of cathode ray tube video displays using a host computer processor.
>
> Worster et al., (US. 6,288,782 B1) discloses method for characterizing defects on semiconductor wafers.
>
> Tanaka et al., (US. 5,568,563) discloses method and apparatus of pattern recognition.

Applicant has reviewed the above-cited prior art made of record and deems it to be no more pertinent than the art discussed above.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

Applicant notes that Examiner cited Emery (US. 6,282,309) in a related case, Ser. No. 09/365,583. Applicant respectfully submits that Emery teaches method and apparatus that is completely different from claim 1 which requires aligning a first image and a second image, and plotting a gray level of a pixel from the first image **against** a gray level of a corresponding pixel from the second image for all aligned pixel locations. Applicant respectfully submits that Emery teaches method and apparatus for inspection of photomasks which entails plotting in T-R space (a coordinate plane defined by T and R orthogonal axes) having coordinates corresponding to transmitted and reflected signal values produced at each inspected pixel of a photomask. Each inspectable point or pixel is represented in the T-R space by a point with coordinates corresponding to the transmitted and reflected signal values produced at that pixel. Those pixels with transmitted and reflected signal values which fall with a uniform tolerance envelope (for example envelope 421 of FIG. 19) are considered to be defect free while all others represent either defects or system noise (see col. 20, lines 27-65). Note that Emery states the following at col. 21, lines 22-26: "Since the present inspection system is not a comparison system, as in the prior art, it is not necessary to know the physical location of a defect on the substrate to determine that there is a defect." and the following at col. 21, lines 59-65: "Additionally, since the defect process depends only on the two measured signals T and R at a single point of the substrate, and does not depend upon the comparison of test and reference images ..., no alignment of the substrate with the defect determination system of the second aspect of the present invention is required. (Emphasis added)" As such, Applicant respectfully submits that Emery teaches away from the requirement of claim 1 of aligning a first image and a second image and plotting a gray level of a pixel from the first image against a gray level of a corresponding pixel from the second image for all aligned pixel locations.

Applicant notes that Emery, at col. 32, lines 14-17, teaches an aspect "to extend the application of transmitted and reflected imaging to photomask pattern inspection with die-to-die or die-to-database comparison." In doing so, Emery teaches sampling both transmitted and

reflected signals, and passing them to a remapping block which remaps each T-R sample to a single grayscale value, and converting the two transmitted and reflected images into a single image (see col. 33, lines 1-5). Then, the single image from a substrate under inspection is compared to a single image from a reference (for example, a reference photomask) by aligning the two images and comparing them (see FIG. 28). Applicant respectfully submits that this teaching of Emery provides is hint or suggestion of any kind for creating a plot of gray levels of pixels from the two "created" images. As such, Applicant respectfully submits that claims 1-7 are patentable over Emery.

In light of the above, Applicants respectfully submit that all the remaining claims are allowable, and Applicants respectfully request that the Examiner reconsider the case and pass the case to issue. Should the Examiner have any questions or wish to discuss any aspect of the application, a telephone call to the undersigned would be welcome.

Respectfully submitted,

By: Michael B. Einschlag

Michael B. Einschlag
Reg. No. 29,301
(650) 949-2267
25680 Fernhill Drive
Los Altos Hills, California 94024

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Not Amended) In an image processing system, a method for relating a first image to a second image comprising:

a) aligning the first image with a second image; and

b) plotting a gray level of a pixel from the first image against a gray level of a corresponding pixel from the second image for all aligned pixel locations.

2. (Not Amended) The method of claim 1 further comprising plotting a threshold window on a plot created in step (b).

3. (Not Amended) The method of claim 1 wherein a plot created in step (b) is stored in a memory array variable.

4. (Not Amended) The method of claim 1 wherein a plot created in step (b) is displayed on a video monitor.

5. (Not Amended) A computer-readable medium storing a program for carrying out the method of claim 1.

6. (Not Amended) A computer-readable medium comprising:

a plurality of memory locations storing data representing a first image and an associated second image, said first and second images each having a plurality of pixels with each pixel being defined by a location coordinate and a gray level; and,

an array comprising a plurality of memory locations storing data representing a plot of the gray levels of pixels from the first image against the gray levels of corresponding pixels from the second image.

7. (Not Amended) A defect inspection system comprising:

(a) an image acquisition unit being operable to acquire a first image and an associated second image, the first and second images each having a plurality of pixels with each pixel being defined by a location coordinate and a gray level;

(b) a plurality of memory locations storing data representing the first image and the second image; and,

(c) a processor being operable to plot the gray levels of pixels from the first image against the gray levels of corresponding pixels from the second image.